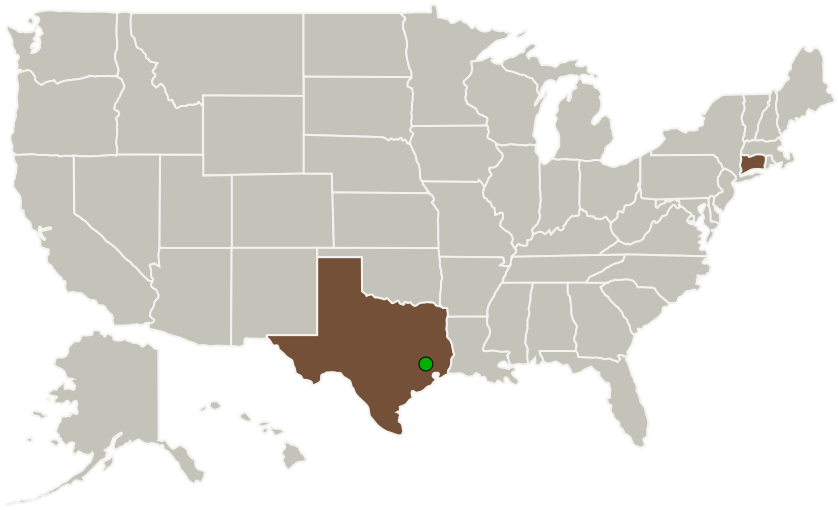
Contact Stress Design Parameters for Titanium Bearings, Phase I

Completed Technology Project (2015 - 2015)

Project Introduction

In response to NASA 2015 SBIR Topic H4.02, Air-Lock proposes to define the maximum allowable contact stress for Titanium bearings. The modulus of Titanium is lower than legacy spacesuit bearing materials (Stainless Steel). Due to this, Titanium bearings are more susceptible to deflection under man and plug load scenarios. Bearing deflection causes a limited number of balls to absorb the full load and results in higher, localized, contact stresses. Localized contact stress is believed to be the main contributor to the bearing race degradation observed during NASA's 2014 oxygen compatibility testing. In Phase 1, we will correlate analytical contact stress data with sample bearing test data. This correlation will characterize bearing wear and degradation relative to ball contact stress. Multiple test iterations will be performed to clearly identify the contact stress that degrades a titanium race. We will also determine if there are commercial surface treatments (coatings) that may enhance Titanium wear resistance. At the conclusion of Phase 1, we shall have identified the maximum allowable bearing contact stress. This data point will serve as a valuable design guideline for future bearing designs and should yield reduced certification and development costs.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Air-Lock, Inc.	Lead Organization	Industry	Milford, Connecticut
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Connecticut	Texas

Project Transitions

June 2015: Project Start

December 2015: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138772)*

Images

Briefing Chart
Contact Stress Design Parameters for Titanium Bearings Briefing Chart *(https://techport.nasa.gov/image/129696)*

Final Summary Chart Image
Contact Stress Design Parameters for Titanium Bearings, Phase I Project Image *(https://techport.nasa.gov/image/134512)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Air-Lock, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

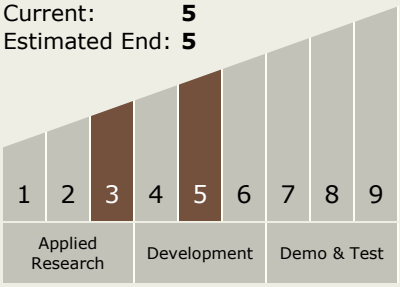
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Brian Battisti

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.2 Extravehicular Activity Systems
    - TX06.2.1 Pressure Garment

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System